REMARKS

References to Applicants' specification herein cite paragraph numbers of the published U.S. Application No. 2005/0095191.

Status of the Claims

Claims **10-13** and **41-58** were pending in the application. In the Office Action at page 2, all rejections were withdrawn against amended claims 10-13. Subsequently, rejections were set forth as follows. Claims 10-13 and 41-58 were rejected under 35 USC § 112, first paragraph, as allegedly failing to comply with the written description and enablement requirements. Claims 10-13 and 41-58 were rejected under 35 USC § 112, second paragraph, as allegedly being indefinite. Claims 10-13 and 41-58 were rejected under 35 USC § 102(b) as allegedly anticipated by Donnet, *et al.*, "Fullerenic carbon in carbon black furnaces," *Carbon* 2000; 38: 1879-1902 (hereafter "Donnet I"). Claims 10-13 and 41-58 were rejected under 35 USC § 102(b) as allegedly anticipated by, or in the alternative, under 35 USC § 103(a) as allegedly obvious over Donnet I. Claims 10-13 and 41-58 were rejected under 35 USC § 102(b) as allegedly anticipated by Burden, *et al.*, "*In situ* fullerene formation – the evidence presented," *Carbon*, 1998; 36(7-8): 1167-1173 (hereafter "Burden I"). Claims 10-13 and 41-58 were rejected under 35 USC § 102(b) as allegedly anticipated by, or in the alternative, under 35 USC § 103(a) as allegedly obvious over Burden I. Claims 10-13 and 41-58 were rejected under 35 USC § 102(b) as allegedly anticipated by Burden, *et al.*, "*In situ* fullerene formation – the evidence presented," [online] *American Carbon Society* [http://acs.omnibooksonline.com/papers/1997_ii376.pdf] (hereafter "Burden II"). Claims 10-13 and 41-58 were rejected under 35 USC § 102(b) as allegedly anticipated by, or in the alternative, under 35 USC § 103(a) as allegedly obvious over Burden II. Claims 10-11, 13, 41-50 and 56-58 were rejected under 35 USC § 102(b) as allegedly anticipated by U.S. Patent 5,851,503 to Mitani, *et al.* (hereafter "Mitani"). Claims 10-11, 13, 41-50 and 56-58 were rejected 35 USC § 102(b) as allegedly anticipated by, or in the alternative, under 35 USC § 103(a) as allegedly obvious over Mitani. Applicants amend claims 10, 47-50, and 56. Support for the claim amendments is provided in Applicants' responses to the 35 USC § 112 rejections. Upon entry of this Response claims **10-13** and **41-58** are presented for examination.

Introductory Remarks

The application describes a process (paragraph 0016) and product, fullerenes chemically bonded to a carbon surface, produced by the disclosed process. The application describes in detail that the tethered fullerenes at the surface of bulk carbon material were imaged and measured using a high-resolution transmission electron microscope (HRTEM) (paragraphs 0017-0021), discloses HRTEM images (FIG. 2 and inset), and summarizes and explains observed results (Table 1, FIG. 3, paragraphs 0022-0027). The results show that the measured perimeter concentration of tethered fullerenes on the surface of bulk carbon material, as prepared by the disclosed process and reported in Table 1, is about an order of magnitude greater than the perimeter concentration of fullerenes measured on the surface of samples prepared by conventional methods. The product produced by the Applicants represents about an order of magnitude improvement compared to the prior art, in terms of a linear (perimeter) concentration, and about two orders of magnitude improvement in terms of an area coverage. Applicants submit that none of the art cited in the prior Office Actions discloses a product or process as described and claimed by Applicants. Applicants believe the application contains patentable subject matter. If the Examiner believes the claims are not allowable because of defects in form or omission of a limitation, Applicants invite the Examiner, in accord with 706 II of the MPEP, to suggest corrective amendments.

Interview Summary

An interview with the Examiner was carried out on December 4, 2008. Co-inventor John Vander Sande participated in the interview. Topics discussed included a Requirement for Information, a 35 U.S.C. 112 rejection relating to chemical bond, and amendment to claims 10 and 56. Regarding the Requirement for Information, Applicants indicated that inquiries had been made for documentation about a private communication between Jack Howard and Mark Meier but that no record of the communication was known to the surviving co-inventors. Applicants reminded the Examiner that a published article relating to functionalized fullerenes was identified as a result of this inquiry and provided to the Examiner in an Information Disclosure Statement. The Examiner reminded the Applicants of their duty of disclosure, and indicated the matter resolved in view of Dr. Howard's death.

Regarding the 112 rejection, the Examiner suggested an alternate experiment, which was not carried out at the time of the invention by the Applicants as Dr. Vander Sande noted. The alternate experiment comprised mixing non-functionalized fullerenes with carbon particles in solution and evaporating the solvent, without high-temperature treatment, and then subjecting the mixture to sonication. Dr. Vander Sande postulated that the results would be consistent with result (1) in Table 1 of the application, or have fewer molecules per perimeter. Dr. Vander Sande explained that Applicants' process as described in paragraphs 0016-0017 of the published application (pages 3-4 of the application as submitted) provided both high temperature and functionalized fullerenes wherein the high temperature drives the kinetics of the reaction to form chemical bonds between the fullerenes and bulk carbon particle's surface atoms. It was also explained that non chemically bonded fullerenes were difficult to observe under HRTEM due to their tendency to migrate along the surface. The Examiner indicated that any published articles describing the difficulty of observing non chemically bonded fullerenes would be helpful to forwarding prosecution.

Draft amendments to the claims were provided to the Examiner and discussed briefly. The Examiner indicated that a new search would be required for the proposed claims.

Additional Items Raised by the Examiner on Pages 2-3 of the Office Action

Election of Species

The Examiner at page 2 of the Office Action has indicated that non-elected species included in claim 11 will be cancelled by an Examiner amendment. Applicants object to the suggested cancellation, and remind the Examiner of 37 CFR 1.141. In particular, claim 10 has been identified as a generic claim. Upon the allowance of a generic claim, Applicants will be entitled to claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim. The species recited in claim 11 include all the limitations of generic claim 10.

Request for Information

As noted above and in the Examiner's Interview Summary, Applicants understand this matter to be effectively resolved. Applicants further understand that should any information regarding the private communication come to light, it is Applicants duty to disclose the

information to the United States Patent and Trademark Office.

Inventor Name

The correct name for inventor Howard is as it appears on the Declaration, Jack B. Howard, who is now deceased.

Reference to Published Application

As stated immediately after the "Remarks" heading in this and the prior Response filed April 11, 2008, references to Applicants' specification herein cite paragraph numbers of the published U.S. Application No. 2005/0095191.

Rejections of Claims

35 USC § 112, First Paragraph, Rejection of Claims: 10-13 and 41-58
Re: "fullerenes" and "about 300 molecules per square micron"

Claims 10-13 and 41-58 were rejected under 35 USC § 112, first paragraph, as allegedly failing to comply with the written description requirement. In particular, at page 4 of the Office Action, the Examiner objects to the amendment of claim 10 to recite fullerenes and alleges that Applicants "have stated *on and for the record* that it was unclear what was actually being observed." The Examiner concludes this from a cited clause within a sentence appearing in paragraph 0019 of the application.

Applicants maintain, as stated in the prior Response filed April 11, 2008, that support for the amendment to include "fullerenes" is provided within paragraphs 0016-0022, Table I and FIGS. 2-3 of the Application. Applicants submit that the Examiner misinterprets the information provided in the specification. In particular, the Examiner cites as evidence from paragraph 0019 the following sentence: " 'The hand-drawn black line in the inset to Figure 2 shows the boundary between the area that was analyzed and the particle interior, *whose thickness presents too many stacked carbon layers to allow for accurate structural identification*.' (Emphases added by Examiner.)" The emphasized clause modifies "particle interior," not the peripheral region where fullerenes were observed, measured, and reported in Table I and FIGS. 2-3. In this sentence, the Applicants simply point out that accurate structural identification cannot be made when attempting to identify fullerenes in the interior of a particle. This is in contrast to the case

wherein fullerenes are tethered at the periphery, *i.e.*, the region in the inset of FIG. 2 to the upper left of the black line where the fullerenes are denoted. Applicants submit that the end of paragraph 0019, paragraph 0020, data presented in FIG. 3, and Table 1 provide clear written description support in a manner that would reasonably convey to one skilled in the relevant art that fullerenes were observed tethered to the samples.

In regards to the recitation of "fullerenes," the Applicants noted in the specification in paragraphs 0017-0020 and 0023-0026 that they used caution in arriving at their conclusion that they observed tethered fullerenes, such as tethered C_{60}. The end of paragraph 0019 and paragraphs 0020 and 0023 disclose the qualitative and quantitative analyses that led the Applicants to conclude "that fullerenes have been tethered to the carbon black surface, and furthermore, that these fullerenes are observable with HRTEM." (Paragraph 0023)

On page 4 of the Office Action, the Examiner additionally rejected claim 10 in view of the recited element "wherein the average surface area concentration of fullerenes is greater than about 300 molecules per square micron." Applicants have amended claim 10 to recite, "wherein the average fullerene concentration on the surface of the bulk carbon material is at least 87 molecules per 1000 nanometers of perimeter." Support for this amendment can be found in paragraphs 0017-0021, Table 1 and FIG. 2. The number "87" taken from Table 1 represents the lower value of observed tethered fullerene concentration for the samples prepared by the method disclosed in paragraph 0016. It is expressly disclosed in paragraph 0017 that an average value was reported, "The data then were aggregated across all the images of a particular sample to provide fullerene linear concentration data..." Accordingly, Applicant submits that there is clear written description support for currently amended claim 10 and claim 56.

For at least the reasons and evidence provided above, Applicants submit that amended claim 10 contains subject matter described in the specification explicitly, inherently, and/or implicitly in such a way as to reasonably convey to one skilled in the art that the inventors, at the time the application was filed, had possession of the claimed invention. For at least these reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 10-13 and 41-58 under 35 USC § 112, first paragraph, as allegedly failing to comply with the written description requirement to the extent the rejection is maintained against the claims as amended.

35 USC § 112, First Paragraph, Rejection of Claims: 10-13 and 41-58
Re: "chemically bonded"

Claims 10-13 and 41-58 were rejected under 35 USC § 112, first paragraph, as allegedly failing to comply with the written description requirement. In particular, at page 5 of the Office Action, the Examiner incorporates by reference a rejection of the prior non-final Office Action mailed October 11, 2007 pertaining to "chemical bond."

The application discloses a process (paragraph 0016 of the published application) of treating a surface of carbon black with functionalized fullerenes. In the telephonic interview of December 4, 2008, Dr. Vander Sande explained that Applicants' process as described in paragraphs 0016-0017 of the published application (pages 3-4 of the application as submitted) provided both high temperature and functionalized fullerenes wherein the high temperature drives the kinetics of the reaction to form chemical bonds between the fullerenes and atoms or molecules of the bulk carbon surface. Applicants have viewed fullerenes attached to the surface of the carbon particles using high-resolution transmission electron microscopy (HRTEM), as disclosed in the application at paragraphs 0016-0022, Table I and FIGS. 2-3. Applicants also noted in the 132 Declaration, pages 2-3, "Later work at MIT showed that C_{60} fullerene can give an observable electron microscope image if the molecule is held in the electron beam of the microscope long enough to give sufficient signal for imaging. ... In the MIT work, C_{60} is held in place by chemically bonding it to the surface of a carbon black particle. (Goel *et al.*, *Carbon*, Vol. 42 (2004) pp. 1907-1913."

Applicants further direct the attention of the Examiner to the following published articles, copies of which are provided with this response, which all express the difficulty of observing fullerenes using HRTEM: A. Goel *et al.*, "Size analysis of single fullerence molecules by electron microscopy," *Carbon* 42 (2004) pp. 1907-1915; T. Fuller and F. Banhart, "*In situ* observation of the formation and stability of single fullerene molecules under electron irradiation," *Chem. Phys. Lett.* 254 (1996) pp 372-378; K. Das Chowdhury *et al.*, "Fullerenic nanostructures in flames," *J. Mater. Res.* 11 (1996) pp. 341-347; and J. Howard *et al.*, "Carbon shells in flames," *Nature* 370 (1994) p. 603. All articles indicate that care must be taken when trying to observe fullerenes to avoid damaging the structures. (See Goel, page 1913, middle of 2nd column; Fuller, page 375, bottom of 1st column to 2nd column; Cowdhury, page 342, mid 2nd column; Howard, page 603, bottom of 1st column to 2nd column. Both Goel and Fuller describe

migration of the fullerenes when viewed by HRTEM. Fuller notes that the fullerenes "mostly vanished behind the larger particles on which they slowly moved along in all possible directions, leading to a gradually decreasing visibility." (Page 375, bottom of 1st column.) Goel also notes observation of "C_{60}, and other fullerenic molecules, migrating 'behind' the carbon black under some observation conditions." (Page 1913, mid 2nd column.) These results point to the difficulties associated with viewing fullerenes *via* HRTEM when the fullerenes are not chemically bound to the surface of a particle. The improvements in imaging achieved by the applicants, see in particular the inset of FIG. 2, provide evidence supporting Applicants' conclusion that the fullerenes are chemically bound to the surface.

In the prior non-final Office Action mailed October 11, 2007, the Examiner states at page 9, "The Examiner is placing no weight on the Goel reference, as it has no relevance to the inquiry as a post-filing date reference." Applicant submits that the Goel reference was submitted for publication prior to the filing date of the application. The cited reference is therefore probative as to whether the inventors, at the time the application was filed, had possession of the claimed invention.

For the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 10-13 and 41-58 under 35 USC § 112, first paragraph, in regards to chemical bonding, to the extent the rejection is maintained against the claims as amended.

35 USC § 112, First Paragraph, Rejection of Claims: 10-13 and 41-58
Re: "surface area concentration"

Claims 10-13 and 41-58 were rejected under 35 USC § 112, first paragraph, as allegedly failing to comply with the enablement requirement in regards to the claimed surface area concentration. In particular, the Examiner indicates at pages 5 and 6 of the Office Action that the specification does not disclose, in a manner which would not result in undue experimentation, how to deposit a surface concentration of C_{60} molecules to within one molecule, *e.g.*, 301 rather than 300.

Applicants' base claims 10 and 56, as amended, do not claim depositing a number of molecules per unit surface dimension to within a value of one molecule. Rather, the claims recite "at least 87 molecules per 1000 nanometers." Applicants do not claim that they can control the surface concentration of C_{60} molecules to within one molecule. This number was

taken from one of Applicants' observations as reported in Table 1. A second observation of a treated sample yielded a larger number. Applicants are claiming a lower bound based upon their experimental observations, as detailed in paragraphs 0017-0021, FIGS. 2-3, and Table 1. Applicants described methods of preparing and analyzing the samples which led to these results. Applicants submit that the written description discloses at least at paragraphs 0016-0023, Table 1, and FIGS. 2-3 in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, how to make and/or use the invention. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 10-13 and 41-58 under 35 USC § 112, first paragraph, as allegedly failing to comply with the enablement requirement to the extent the rejection is maintained against the claims as amended.

35 USC § 112, Second Paragraph, Rejection of Claims: 10-13 and 41-58

Re: "chemically bonding"

Claims 10-13 and 41-58 were rejected under 35 USC § 112, second paragraph, as allegedly indefinite in regards to the claimed chemical bonding. In particular, at page 6 of the Office Action, the Examiner incorporates by reference an analysis set forth in the prior non-final Office Action mailed October 11, 2007.

On page 2 of the present Office Action, the Examiner withdrew all rejections of the claims. The Applicants made no amendments relating to "chemically bonded" as recited in base claims 10 and 56. Applicants' arguments presented in the Response filed April 11, 2008 presumably led to the withdrawal, as stated on page 2 of the Office Action, of the rejection under 35 USC § 112, second paragraph, relating to "chemical bond." The Examiner has not set forth new reasons to provide a basis for a new rejection of claims 10-13 and 41-58 under 35 USC § 112, first paragraph, relating to "chemical bond." Accordingly, Applicants invite the Examiner to identify and set forth new reasons providing a basis for a new rejection of claims 10-13 and 41-58 under 35 USC § 112, first paragraph, relating to "chemical bond," or to identify shortcomings in Applicants' reasoning set forth in the prior Response filed April 11, 2008.

The base claims recite "chemically bonded to a surface of bulk carbon material." The Examiner has acknowledged that a carbon-carbon bond is a chemical bond. As presented in the prior Response filed April 11, 2008, "Applicants submit that one skilled in the art would interpret 'chemically bonded to a surface' to comprise valence bonding with surface atoms or

surface molecules. Applicants submit that the term physical bond is broader than chemical bond, and necessarily cannot be read upon chemical bond." For a description of how functionalized molecules can be bonded to a surface, Applicants invite the Examiner to review the discussion at http://en/wikipedia.org/wiki/Functional-group under "Applications" regarding surface treatment of materials. Applicants invite the Examiner to suggest corrective wording of the claim that would move prosecution forward regarding this matter.

Since the same prior rejection was withdrawn in the Office Action, and new reasoning has not been set forth to provide a basis for the repeated rejection of claims 10-13 and 41-58 under 35 USC § 112, second paragraph in regards to chemical bonding, Applicants respectfully request reconsideration and withdrawal of the rejection.

35 USC § 102(b) Rejection: Claims 10-13 and 41-58

Re: Donnet I

Claims 10-13 and 41-58 were rejected under 35 USC § 102(b) as allegedly anticipated by Donnet I. In particular, the Examiner at page 7 of the Office Action cites Donnet I at Figure 1 and Figure 2 as allegedly anticipating *via* inherency Applicants' claimed invention. Applicants respectfully traverse the rejection.

In Figure 1, Donnet I denotes a region at the interior of the particle and notes in the caption "TEM image of a furnace carbon black showing the fullerenic structure *inside* the particle." (Emphasis added.) Applicants' claims are not directed to fullerenic structures located *inside* a particle. The scale marker shows a highlighted region about 5 nanometers across, a dimension much larger than a C_{60} fullerene. It is not clear what is being identified in the figure, nor has the Examiner particularly pointed out anything in this figure relating to Applicants' base claims 10 and 56. Figure 1 of Donnet I does not disclose fullerenes chemically bonded to a surface of bulk carbon material.

Referring to Figure 2 of Donnet I, three items are identified as viewed within a small area. There is no discussion in Donnet I as to whether the observed area is a surface located truly at the periphery of a particle, *e.g.*, a region corresponding to a location to the left of the black line drawn in the inset of Applicants' Figure 2, or located within the particle interior, *e.g.*, a region corresponding to a location to the right of the black line in Applicants' Figure 2 where the thickness presents too many stacked carbon layers to allow for accurate structural identification.

Looking at Donnet I's Figure 2, the first identified object is a long black object, which does not resemble Applicants' circular white patterns surrounding a black center referred to in Applicants' Figures 2 and 3. The other two objects of Donnet I bear better resemblance to Applicants' observed images if the contrast of Donnet I's image is reversed. Granting a contrast reversal, and despite the uncertainty about the imaged region, there is no disclosure in Donnet I of an average perimeter concentration. The imaged area in Donnet I is too small to be relied upon for determining an average perimeter concentration for bulk carbon material.

Applicants reported, in the written description at Table 1, data about the average perimeter concentration of fullerenes on carbon black samples prepared by methods such as disclosed by Donnet I, and found the perimeter concentration to be lower, by about an order of magnitude, than the concentration on samples as prepared and claimed by Applicants. In view of Applicants' measurements on samples prepared by similar conventional methods as described in Donnet I and the analysis of Donnet I's figures set forth above, Applicants submit that Donnet I does not inherently disclose the invention as claimed by Applicants. Rather, Applicant's measurements disclose that samples such as those used by Donnet I inherently have a perimeter concentration about an order of magnitude lower than samples prepared by Applicants' methods. Since Donnet I does not disclose each and every element of Applicants' claims 10 and 56, Donnet I does not anticipate Applicants' claimed invention. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 10-13 and 41-58 under 35 USC § 102(b) to the extent the rejection is maintained against the claims as amended.

35 USC § 102(b)/103(a) Rejection: Claims 10-13 and 41-58

Re: Donnet I

Claims 10-11, 13, 41-50 and 56-58 were rejected 35 USC § 102(b) as allegedly anticipated by, or in the alternative, under 35 USC § 103(a) as allegedly obvious over Donnet I. The reasoning set forth above in regards to the 35 USC § 102(b) rejection of claims 10-13 and 41-58 is repeated with full force and effect. The Applicants note that the Examiner has issued a duplicate 102(b) rejection, and remind the Examiner, in accord with MPEP 706.02 I, that "merely cumulative rejections, *i.e.*, those which would clearly fall if the primary rejection were not sustained, should be avoided."

Regarding the 103(b) rejection, Applicants submit that Donnet I teaches of preparing the

product using industrial furnace reactors. (page 1885) Applicants have measured surface concentrations on samples prepared in this manner to be about an order of magnitude lower, in terms of a perimeter concentration, than Applicants' claimed invention. Accordingly, Applicants submit that Donnet I teaches a method of sample preparation that yields an inferior product, and therefore Donnet I teaches away from Applicants' claimed product. Since Donnet I describes a product produced by conventional methods and Applicants have measured and determined such products to be inferior products by an order of magnitude in terms of perimeter concentration, Applicants submit that it would not be obvious to one of ordinary skill in the art to arrive at Applicants' claimed invention following the teachings of Donnet I. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 10-13 and 41-58 under 35 USC § 103(a) to the extent it is maintained against the claims as amended.

35 USC § 102(b) Rejection: Claims 10-13 and 41-58
35 USC § 102(b)/103(a) Rejection: Claims 10-13 and 41-58
Re: Burden I, and Burden II

On page 2 of the Office Action, the Examiner withdrew all rejections of the pending claims in view of the amendments to the claims. The Examiner has repeated from the prior Office Action mailed October 11, 2007 all rejections regarding Burden I and Burden II without providing new reasoning to provide a basis for the repeated rejections against the amended claims 10-13 and 41-58 under 35 USC § 102(b) or 35 USC § 102(b)/103(a) and without response to Applicants' particular arguments. Applicants submit that Burden provides nothing new over Donnet I. Applicants remind the Examiner again that "merely cumulative rejections, *i.e.*, those which would clearly fall if the primary rejection were not sustained, should be avoided." Applicants' reasoning set forth above with respect to Donnet I is equally applicable to Burden I and II. Since the same prior rejection was withdrawn in the Office Action and new reasoning has not been set forth to provide a basis for the repeated rejection of claims 10-13 and 41-58 under 35 USC § 102(b) or 35 USC § 102(b)/103(a) in regards to Burden I and Burden II, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 10-13 and 41-58 under 35 USC § 102(b)/103(a) to the extent they are maintained against the claims as amended, or set forth new reasoning relevant to the amended claims.

35 USC § 102(b) Rejection: Claims 10-11, 13 and 41-58

35 USC § 102(b)/103(a) Rejection: Claims 10-11, 13 and 41-58

Re: Mitani

Claims 10-11, 13, 41-50 and 56-58 were rejected 35 USC § 102(b) as allegedly anticipated by Mitani and again under 35 USC § 102(b) as allegedly anticipated by, or in the alternative, under 35 USC § 103(a) as allegedly obvious over Mitani. At page 11 of the Office Action, the Examiner cites column 2, line 20 *et seq.* and column 3, line 65 *et seq.* of Mitani as teaching fullerene clusters that polymerize, and the Examiner submits that "all other features appear to be taught or reasonably suggested." Applicants respectfully traverse the rejection.

Mitani does not disclose chemically bonding fullerenes to a surface of a bulk carbon material wherein the average fullerene concentration on the surface of the bulk carbon material is at least 87 molecules per 1000 nanometers of perimeter as Applicants claim. Mitani teaches forming fullerene clusters comprising between 5 and 53 molecules. (Col. 5, lines 42-48.) The fullerene clusters are formed by irradiating a coagulated sample of fullerenes with 355 nm laser irradiation. (Col. 5, lines 10-14. Col. 7, lines 51-52.) Mitani also teaches "Fullerene monomers do not react with each other when excited by ultra-violet ray." (Col. 9, lines 32-34.) Applicants find no teachings or suggestions in the sections cited by the Examiner or elsewhere in Mitani of each and every element claimed by Applicants in claims 10 and 56. Applicants submit that clusters of up to 53 fullerenes do not represent bulk carbon material. There is no teaching or suggestion in Mitani as to whether the disclosed process would chemically bind fullerenes to a surface of bulk carbon material, *e.g.*, to the surface of carbon black particles, instead of forming fullerene clusters, which may not react with bulk carbon material. Applicants submit that Mitani does not disclose, teach or suggest each and every element of Applicants' claim 10, and invite the Examiner to particularly point out where Mitani teaches or suggests chemical bonding of fullerenes to a surface of bulk carbon material. Since Mitani provides no disclosure or teachings directed to chemically binding fullerenes to the surface of bulk carbon material, an element of Applicants' claims 10 and 56, Applicants submit that one of ordinary skill in the art could not arrive at Applicants' claimed invention following the disclosure of Mitani without undue experimentation and an inventive step. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 10-13 and 41-58 under 35 USC § 102(b)/103(a) regarding Mitani to the extent the rejections are maintained against the amended claims.

CONCLUSION

In view of the above, Applicants submit that all presently pending claims are in condition for allowance, and early indication thereof is respectfully requested. If the Examiner feels that a telephone call would expedite the prosecution of this case, the Examiner is invited to call the undersigned at (617) 248-5143.

Date: December 22, 2008

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